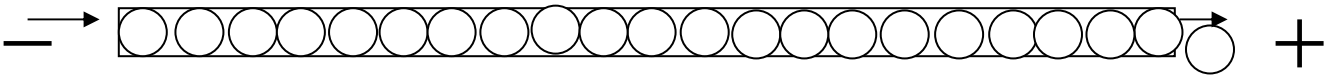
INFORMATION SHEET 2: Current flow

Current flow is the movement of charge carriers through a conductive medium. That's just a fancy way of saying we're going to push or pull some electrons through a wire. "Conventional current" is the flow of positive charges, positive to negative. "Electron" current is the flow of negative charges, negative to positive. Electronics uses electron current. "Electron current" is used throughout these discussions.

When we apply an electromotive force (EMF)(voltage) to a wire it appears current flows from one end to the other at the speed of light. One might think that an electron pushed into one end of the wire races frantically to the other end of the wire. Alas, this is not the case.

Due to ambient heat, that's anything above absolute zero, electrons in a conductive material are roaming about freely. Inches of movement can take minutes or more. When an EMF is applied between the ends of a wire these free electrons take notice and move from the negative potential toward the positive potential. The action is somewhat like BB's in a straw. The negative force pushes on the nearest negative charges. Those charges push the next charges, which push the next charges.... all the way to the end finally pushing the end charges to the attracting positive potential. The effect appears instantaneous but it's not the same electron that was first pushed.



Electron current can flow in other mediums as well. Figure 1 shows a gas filled tube. Connecting a negative potential to the cathode and positive to the plate applies energy to the gas. This results in some electrons leaving their atoms and heading for the attraction of the positive plate. When a gas is energized in this way it is said to be "ionized". An "Ion" is simply an atom which has lost electrons. Gases tend to glow when ionized. This is because some of the freed electrons fall back into an atom giving up their increased energy in the form of light. Note: The "dot" in the tube indicates gas filled.

Electrons can also flow in a vacuum. Those electrons have to come from some source since a vacuum has no conducting material. Figure 2 shows a Radio vacuum tube with a heater and cathode with which to produce free electrons. The heating of the cathode releases electrons in a process called "Thermionic Emission". These free electrons form a cloud near the cathode. Connecting a voltage, negative to cathode and positive to the Plate will cause electron current to flow between them.

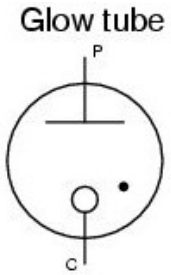


Figure 1

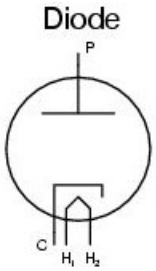


Figure 2

Current flow in liquids is essentially the same as in gases. Ions, atoms that have lost some electrons, no longer have a neutral charge but now appear to have a positive charge. Therefore Ions move in the opposite direction of the electron current.

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